



U.S. Department of Agriculture
Forest Service
Southern Region

Species Diversity Report

George Washington National Forest

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DRAFT

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1.0 Introduction

Planning for ecological sustainability is an iterative two-stage process that involves first providing for a diversity of ecosystems in the Land and Resource Management Plan (also referred to as the Forest Plan or the Plan) and then by developing additional components to meet the biological needs of specific species or species groups. Most plant and animal species will be sustained by managing for a diversity of ecosystems in the Plan area. However, additional provisions may be needed to help provide ecological conditions for specific species such as federally listed threatened and endangered (T&E) species, sensitive species and locally rare species.

This Species Diversity Report is a supplement to the Ecosystem Diversity Report (USDA Forest Service 2010a), which described how the ecological characteristics for ecosystems on the George Washington National Forest (GWNF) were identified and incorporated into the plan components of the revised Forest Plan. Ecosystem characteristics were evaluated through development of an Ecological Sustainability Evaluation (ESE) database or tool, best available science, consideration of data and trends documented in the Evaluation of the Need for Change Report/Analysis of the Management Situation (AMS), annual monitoring evaluations, and internal reviews. A similar analysis process was also used to assess species diversity. This report describes the species evaluation process and uses the understanding gained from analysis of ecosystem diversity to develop additional plan components for species diversity.

2.0 Species Diversity

2.2 Ecosystem Context for Species

Nineteen native ecosystems were identified for the GWNF using NatureServe's International Ecological Classification Standards (NatureServe 2004a, 2004b). A system was added to cover caves and karstlands. Current acreage of each system was calculated using Forest Service GIS data. All identified terrestrial ecological systems were documented in a relational database, the ESE tool, which was based on the structure of the TNC planning tool. The ESE tool served as the primary process record for ecological sustainability analysis. It included documentation of scientific and other sources consulted, uncertainties encountered, and strategic choices made during development of the database.

Ecological conditions that provide for ecosystem diversity were incorporated into plan components and described in detail in the Ecosystem Diversity Report (USDA Forest Service 2010a). These ecological conditions were further analyzed to understand the environmental context and ability for National Forest System (NFS) lands to contribute to the diversity of plant and animal species. The following analysis process was used to determine whether, in addition to plan components identified for maintaining ecosystem diversity, further species-specific plan components were necessary to sustain species diversity.

2.3 Identification and Screening of Species

The GWNF started with a statewide species list compiled from a variety of sources including the Birds of Conservation Concern list, Virginia and West Virginia State Heritage Programs tracked

plant and animal lists, Virginia and West Virginia State Comprehensive Wildlife Strategy species of greatest conservation need list, Regional Forester's Sensitive Species list, federally listed Threatened and Endangered Species, and demand species. The original list consisted of 415 plant and animal species with ranges occurring throughout the states.

Appendix 1 lists the 107 species which were removed from the list because they did not occur or have potential to occur on NFS-administered land based upon suitable habitat, range, or expert taxonomic consensus. If these species are found to occur on the GWNF, they will be re-evaluated and carried through the evaluation process. Of the remaining species an additional 74 species were not analyzed further because: a) the species is unaffected by management; b) the Forest is of marginal importance to conservation of the species; c) knowledge of species' ecology is insufficient to support conservation strategy; species' taxonomy is too uncertain to develop conservation strategy; or d) species is common and demonstrably secure on the Forest.

The remaining 232 species are addressed in this analysis.

3.0 Threatened and Endangered Species

This section covers threatened and endangered (T&E) species, which are those species listed by the Department of the Interior, U.S. Fish and Wildlife Service, or the National Oceanic and Atmospheric Administration, National Marine Fisheries Service as threatened or endangered. The U.S. Fish and Wildlife Service (USFWS) is the agency responsible for listing T&E species on lands managed by the GWNF. The Forest Service cooperates with USFWS efforts in conserving T&E species through protection and habitat management. The Forest Service conducts activities and programs to assist in the identification, conservation, and protection of threatened and endangered species and their habitats. Site specific evaluations are conducted for any proposed activity that may take place within habitat for these species or near known populations. The GWNF program priorities for T&E species include:

- Implement Forest Service actions as recommended in recovery plans for federally listed species. In the absence of an approved recovery plan, implement and, if necessary develop interim Forest Service conservation measures. Update interim conservation measures as needed when new science becomes available.
- Work with USFWS and other conservation partners to develop recovery plans for federally listed species and candidate conservation agreements for species proposed for listing.
- Coordinate with partners to implement measures to resolve conflicts with threatened and endangered species and their habitats.
- Monitor trends in population and/or habitat of federally listed species.

3.1 Threatened and Endangered Species List

The GWNF worked cooperatively with the USFWS to develop the list of federally threatened or endangered species to be considered in the ESE process. Eight T&E species were evaluated in the ESE process (Table 1). These 8 species are further described below.

Table 1. Federally listed T&E species included in Forest Plan revision process

Taxa	Species	Status
Mammal	Indiana Bat (<i>Myotis sodalis</i>)	Endangered
Mammal	Virginia Big-Eared Bat ()	Endangered
Mussel	James Spiny Mussel (<i>Pleurobema collina</i>)	Endangered
Vascular Plant	Shale Barren Rock Cress (<i>Arabis serotina</i>)	Endangered
Vascular Plant	Smooth Cone Flower (<i>Echinacea laevigata</i>)	Endangered
Vascular Plant	Virginia Sneezeweed (<i>Helenium virginicum</i>)	Threatened
Vascular Plant	Swamp Pink (<i>Helonius bullata</i>)	Threatened
Vascular Plant	Northeastern Bulrush (<i>Scirpus ancistrochaetus</i>)	Endangered

3.2 Indiana Bat

Current Threats

Responses to Threats

3.3 Virginia Big-Eared Bat

Current Threats

Response to Threats

3.4 James Spiny Mussel

Threats

Response to Threats

3.5 Shale Barren Rock Cress

Threats

Response to Threats

3.6 Smooth Cone Flower

Threats

Response to Threats

3.7 Virginia Sneezeweed

Threats

Response to Threats

3.8 Swamp Pink

Threats

Response to Threats

3.9 Northeastern Bulrush

Threats**Response to Threats****3.7 Plan Components for T&E Species**

The types of Forest Plan components that provide for species diversity include desired conditions, objectives, standards, and management prescriptions. Desired conditions, objectives, and standards for species diversity are integrated throughout the Plan, and while they are addressed primarily in the species diversity and ecosystem diversity sections, additional plan components for healthy watersheds and healthy forests support species diversity through vegetation management practices, appropriate fire regimes, intact hydrologic functions, and productive soils.

In the revised Forest Plan, T&E species protection and T&E habitat enhancement are priorities, so their needs are particularly emphasized. The Plan components for ecosystem diversity described in Section 3.4 of the Ecosystem Diversity Report (USDA Forest Service 2009a) should improve and maintain habitat conditions for T&E species within each ecological system. Restoration, maintenance, and enhancement of all ecological systems generally provide for a diverse and sustainable population of species throughout the Forest. So, plan components for ecosystem diversity provide a strong foundation for protecting and promoting habitat for T&E species.

Since federally listed T&E species have additional mandates guiding their management, they are considered individually in the Forest Plan, as well as within the context of their respective ecological systems. Plan components for species diversity (such as desired conditions, objectives, and standards) also provide additional support for long-term sustainability of T&E species. Table 2 identifies components included in the Plan to support individual T&E species. Some standards within the Plan are specific to T&E species, while most encompass needs and protection of T&E species along with other species and their associated ecosystems. Special areas also support species diversity by designating distinctive locations with natural features and settings that are managed for botanical or research values. In many cases, these areas conserve desired native ecosystems and rare communities that support T&E species.

Table 2. T&E species, associated ecological systems, and plan component

Species	Ecosystem	Forest Plan Component
Indiana bat	Caves and Karstlands	Special Areas: designation of the primary and secondary Indiana bat cave areas Standards/Guidelines: standards for activities within the primary and secondary Indiana bat cave areas; standards for activities throughout the Forest in regard to leave trees during timber harvest activities Objectives: improvement of habitat through increased open woodlands
Virginia Big-Eared Bat	Caves and Karstlands	

Species	Ecosystem	Forest Plan Component
James Spiny Mussel	Floodplains, Wetlands and Riparian Areas	Standards: Riparian standards
Shale Barrens Rock Cress	Appalachian Shale Barrens	Special Areas: All known locations are in Special Biologic Areas
Smooth Cone Flower		Special Areas: All known locations are in Special Biologic Areas
Virginia Sneezeweed	Floodplains, Wetlands and Riparian Areas	Special Areas: All known locations are in Special Biologic Areas Standards: Riparian standards
Swamp Pink	Floodplains, Wetlands and Riparian Areas	Special Areas: All known locations are in Special Biologic Areas Standards: Riparian standards
Northeastern Bulrush	Floodplains, Wetlands and Riparian Areas	Special Areas: All known locations are in Special Biologic Areas Standards: Riparian standards

The Indiana bat standards and special area designations carry over from the 1997 Biological Opinion. The riparian standards are direct result of the Fish and Mussel Conservation Plan developed to address aquatic and riparian threatened and endangered species. Special Biologic Areas are designated to protect known locations of T&E species.

4.0 Other Species Addressed

4.1 Species list

Criteria for identifying other species to be addressed include the following:

- Species identified as proposed and candidate species under ESA.
- Species ranked G-1, G-2 and G-3 on the NatureServe ranking system.
- Subspecific taxa ranked T-1, T-2 and T-3 on the NatureServe ranking system.
- Species that have been petitioned for federal listing and for which a positive “90-day finding” has been made.
- Species that have been recently delisted, including those delisted within the past five years and other delisted species for which regulatory agency monitoring is still considered necessary.
- Species with ranks of S-1, S-2, N-1, or N-2 on the NatureServe ranking system¹
- State-listed threatened and endangered species that do not meet other criteria
- Species identified as species of conservation concern in state comprehensive wildlife strategies
- Bird species on the U.S. Fish and Wildlife Service Birds of Conservation Concern National Bird Priority List
- Additional species that valid existing information indicates are of regional or local conservation concern due to factors that may include:
 - Significant threats to populations or habitat
 - Declining trends in populations or habitat
 - Rarity
 - Restricted ranges
 - Southern Region regional forester’s sensitive species
- Species that are hunted or fished
- Other species of public interest
- Invasive species may also be considered

The 224 species remaining for further consideration were screened to determine whether ecosystem diversity plan components fully covered their sustainability needs. 111 species were considered covered by ecosystem diversity plan components. Plan components for these 111 species were described in Section 3.4 of the Ecosystem Diversity Report (USDA Forest Service

¹ The NatureServe ranking system is available at <http://www.natureserve.org/>.

2009a). 113 species required development of additional plan components to support species sustainability.

4.2 Species that require additional plan components

Specific plan components were developed for xx species (Table 3). For these species, the ecosystem diversity components did not sufficiently address the needs of the species or there was desire to have additional plan direction for the species. The list consists of species that may have a very limited distribution, have declining populations, are potentially impacted by management activities, or for which additional plan direction is desired and we have adequate information about their life histories and habitats to create plan components. Species groupings were used to identify commonly shared conservation needs and develop appropriate Plan provisions. Species were grouped by their threats and limiting factors where possible. Some species required multiple groups to cover their needs. Section 5 of this report identifies the additional plan components developed for these groups (and the species which were part of these associations).

Table 3. Species for which additional plan components were developed

Species Group	Taxa	Scientific Name	Common Name
Area Sensitive grasslands, shrublands, open wetlands, and/or open woodlands	Invertebrate	<i>Cicindela patruela</i>	Barrens tiger beetle
Area Sensitive grasslands, shrublands, open wetlands, and/or open woodlands	Bird	<i>Haliaeetus leucocephalus</i>	bald eagle
Area Sensitive grasslands, shrublands, open wetlands, and/or open woodlands	Invertebrate	<i>Speyeria idalia</i>	Regal fritillary
Coarse Woody Debris/Downed Wood	Snail	<i>Helicodiscus diadema</i>	Shaggy coil
Coarse Woody Debris/Downed Wood	Invertebrate	<i>Paravitrea reesi</i>	Round supercoil
High Elevation Boulderfields	Vascular Plant	<i>Heuchera alba</i>	white alumroot
High Elevation Openings, grassy or shrubby	Vascular Plant	<i>Hypericum mitchellianum</i>	Blue Ridge St. John's-wort
High Elevation Openings, grassy or shrubby	Bird	<i>Thryomanes bewickii altus</i>	Appalachian Bewick's wren
Leaf Litter	Snail	<i>Helicodiscus diadema</i>	Shaggy coil
Leaf Litter	Invertebrate	<i>Paravitrea reesi</i>	Round supercoil
Occurrence Protection	Vascular Plant	<i>Buckleya distichophylla</i>	Piratebush
Occurrence Protection	Vascular Plant	<i>Carex polymorpha</i>	variable sedge
Occurrence Protection	Vascular Plant	<i>Carex roanensis</i>	Roan Mountain sedge
Occurrence Protection	Invertebrate	<i>Catocala herodias gerhardi</i>	Herodias underwing
Occurrence Protection	Vascular Plant	<i>Corallorhiza bentleyi</i>	Bentley's coalroot
Occurrence Protection	Bird	<i>Falco peregrinus</i>	peregrine falcon
Occurrence Protection	Vascular Plant	<i>Gaylussacia brachycera</i>	box huckleberry

Species Group	Taxa	Scientific Name	Common Name
Occurrence Protection	Vascular Plant	Gymnocarpium appalachianum	Appalachian oak fern
Occurrence Protection	Bird	Haliaeetus leucocephalus	bald eagle
Occurrence Protection	Vascular Plant	Heuchera alba	white alumroot
Occurrence Protection	Vascular Plant	Hypericum mitchellianum	Blue Ridge St. John's-wort
Occurrence Protection	Vascular Plant	Juglans cinerea	butternut
Occurrence Protection	Vascular Plant	Monotropsis odorata	sweet pinesap
Occurrence Protection	Vascular Plant	Phlox buckleyi	sword-leaved phlox
Occurrence Protection	Vascular Plant	Triphora trianthophora	nodding pogonia
Old Fields	Invertebrate	Speyeria idalia	Regal fritillary
Old Fields	Bird	Thryomanes bewickii altus	Appalachian Bewick's wren
Openings	Invertebrate	Cicindela patruela	Barrens tiger beetle
Openings	Invertebrate	Erynnis persius	Persius duskywing
Openings (Maintained)	Invertebrate	Cicindela patruela	Barrens tiger beetle
Openings (Maintained)	Invertebrate	Speyeria idalia	Regal fritillary
Rock Outcrops	Bird	Thryomanes bewickii altus	Appalachian Bewick's wren
Ruderal	Invertebrate	Cicindela patruela	Barrens tiger beetle
Ruderal	Vascular Plant	Phlox buckleyi	sword-leaved phlox
Sensitive to Fire Injury	Invertebrate	Callophrys irus	Frosted elfin
Sensitive to Over-Collection	Vascular Plant	Panax quinquefolius	Ginseng
Sensitive to Over-Collection	Invertebrate	Pyrgus wyandot	Appalachian grizzled skipper
Sensitive to Over-Collection	Invertebrate	Speyeria diana	Diana fritillary
Sensitive to Over-Collection	Invertebrate	Speyeria idalia	Regal fritillary

Species Group	Taxa	Scientific Name	Common Name
Area Sensitive grasslands, shrublands, open wetlands,and/or open woodlands	Bird	Ammodramus henslowii	Henslow's sparrow
Area Sensitive grasslands, shrublands, open wetlands,and/or open woodlands	Bird	Bartramia longicauda	upland sandpiper
Area Sensitive grasslands, shrublands, open wetlands,and/or open woodlands	Bird	Caprimulgus carolinensis	chuck-will's widow
Area Sensitive grasslands, shrublands, open wetlands,and/or open woodlands	Bird	Caprimulgus vociferus	whip-poor-will
Area Sensitive grasslands, shrublands, open wetlands,and/or open woodlands	Bird	Circus cyaneus	northern harrier
Area Sensitive grasslands, shrublands, open wetlands,and/or open woodlands	Bird	Colinus virginianus	northern bobwhite
Area Sensitive grasslands, shrublands, open wetlands,and/or open woodlands	Bird	Dendroica discolor	prairie warbler

Species Group	Taxa	Scientific Name	Common Name
Area Sensitive grasslands, shrublands, open wetlands, and/or open woodlands	Invertebrate	Erynnis martialis	Mottled duskywing
Area Sensitive grasslands, shrublands, open wetlands, and/or open woodlands	Bird	Lanius ludovicianus	loggerhead shrike
Area Sensitive grasslands, shrublands, open wetlands, and/or open woodlands	Bird	Melanerpes erythrocephalus	red-headed woodpecker
Area Sensitive grasslands, shrublands, open wetlands, and/or open woodlands	Mammal	Sciurus niger	Eastern fox squirrel
Area Sensitive grasslands, shrublands, open wetlands, and/or open woodlands	Bird	Tyto alba	barn owl
Area Sensitive grasslands, shrublands, open wetlands, and/or open woodlands	Bird	Vermivora chrysoptera	golden winged warbler
Canopy Gaps and Openings	Bird	Dendroica cerulea	cerulean warbler
Canopy Gaps and Openings	Bird	Dendroica fusca	blackburnian warbler
Canopy Gaps and Openings	Mammal	Neotoma magister	Alleghany woodrat
Canopy Gaps and Openings	Bird	Oporornis formosus	Kentucky warbler
Canopy Gaps and Openings	Bird	Scolopax minor	American woodcock
Cavity Tree Den Tree	Bird	Aegolius acadicus	northern saw-whet owl
Cavity Tree Den Tree	Bird	Contopus borealis	olive-sided flycatcher
Cavity Tree Den Tree	Bird	Sitta canadensis	red-breasted nuthatch
Cavity Tree Den Tree	Bird	Sphyrapicus varius	yellow-bellied sapsucker
Cavity Tree Den Tree	Bird	Tyto alba	barn owl
Cavity Tree Den Tree	Mammal	Ursus americanus	black bear
Dense, Shrubby Understory	Bird	Dendroica caerulescens	black-throated blue warbler
Dense, Shrubby Understory	Bird	Oporornis formosus	Kentucky warbler
Dense, Shrubby Understory	Bird	Troglodytes troglodytes	winter wren
Grasslands	Bird	Scolopax minor	American woodcock
Grasslands, Shrublands and/or Open Woodlands	Mammal	Mustela nivalis	least weasel
High Elevation Boulderfields	Vascular Plant	Cornus rugosa	roundleaf dogwood
High Elevation Open Woodlands	Bird	Carpodacus purpureus	purple finch
High Elevation Open Woodlands	Bird	Catharus guttatus	hermit thrush
High Elevation Open Woodlands	Bird	Dendroica caerulescens	black-throated blue warbler
High Elevation Open Woodlands	Bird	Oporornis philadelphia	mourning warbler
High Elevation Open Woodlands	Bird	Sphyrapicus varius	yellow-bellied sapsucker
High Elevation Openings, grassy or shrubby	Bird	Carpodacus purpureus	purple finch
High Elevation Openings, grassy or shrubby	Bird	Catharus guttatus	hermit thrush
High Elevation Openings, grassy or shrubby	Bird	Coccyzus erythrophthalmus	black-billed cuckoo
High Elevation Openings, grassy or shrubby	Bird	Contopus borealis	olive-sided flycatcher
High Elevation Openings, grassy or shrubby	Vascular Plant	Cuscuta rostrata	beaked dodder

Species Group	Taxa	Scientific Name	Common Name
High Elevation Openings, grassy or shrubby	Vascular Plant	Gnaphalium uliginosum	low cudweed
High Elevation Openings, grassy or shrubby	Vascular Plant	Juniperus communis var depressa	ground juniper
High Elevation Openings, grassy or shrubby	Mammal	Lepus americanus	snowshoe hare
High Elevation Openings, grassy or shrubby	Bird	Melospiza georgiana	swamp sparrow
High Elevation Openings, grassy or shrubby	Vascular Plant	Rubus idaeus ssp. strigosus	American red raspberry
High Elevation Openings, grassy or shrubby	Bird	Vermivora chrysoptera	golden winged warbler
Occurrence Protection	Bird	Ammodramus henslowii	Henslow's sparrow
Occurrence Protection	Invertebrate	Catocala marmorata	Marbled underwing
Occurrence Protection	Vascular Plant	Cornus canadensis	bunchberry
Occurrence Protection	Vascular Plant	Cornus rugosa	roundleaf dogwood
Occurrence Protection	Vascular Plant	Cuscuta coryli	hazel dodder
Occurrence Protection	Vascular Plant	Cuscuta rostrata	beaked dodder
Occurrence Protection	Vascular Plant	Desmodium cuspidatum	toothed tick-trefoil
Occurrence Protection	Reptile	Eumeces anthracinus	coal skink
Occurrence Protection	Vascular Plant	Goodyera repens	dwarf rattlesnake plantain
Occurrence Protection	Vascular Plant	Leucothoe fontanesiana	highland dog-hobble
Occurrence Protection	Vascular Plant	Pyrola elliptica	shinleaf
Old Fields	Bird	Colinus virginianus	northern bobwhite
Old Fields	Vascular Plant	Juniperus communis var depressa	ground juniper
Old Fields	Bird	Lanius ludovicianus	loggerhead shrike
Old Fields	Bird	Meleagris gallopavo	wild turkey
Old Fields	Mammal	Mustela nivalis	least weasel
Old Fields	Vascular Plant	Prunus nigra	Canada plum
Old Fields	Bird	Tyto alba	barn owl
Old Fields	Bird	Vermivora chrysoptera	golden winged warbler
Openings	Vascular Plant	Anaphalis margaritacea	pearly everlasting
Openings	Reptile	Glyptemys insculpta	wood turtle
Openings	Vascular Plant	Oryzopsis asperifolia	white-grained mtn-ricegrass
Openings (Maintained)	Bird	Bonasa umbellus	ruffed grouse
Openings (Maintained)	Reptile	Eumeces anthracinus	coal skink
Openings (Maintained)	Bird	Meleagris gallopavo	wild turkey
Openings (Maintained)	Mammal	Odocoileus virginianus	white-tailed deer
Openings (Maintained)	Invertebrate	Polygonia progne	Gray comma
Openings (Maintained)	Mammal	Ursus americanus	black bear
Rock Outcrops	Vascular Plant	Helianthemum bicknellii	plains frostweed
Rock Outcrops	Vascular Plant	Houstonia canadensis	Canada bluets
Rock Outcrops	Mammal	Neotoma magister	Alleghany woodrat
Rock Outcrops (Limestone)	Vascular Plant	Oligoneuron rigidum	stiff goldenrod
Rock Outcrops (Limestone)	Vascular Plant	Paronychia virginica	yellow nailwort

Other Species

Species Group	Taxa	Scientific Name	Common Name
Rock Outcrops (Limestone)	Vascular Plant	Paxistima canbyi	Canby's mountain lover
Ruderal	Vascular Plant	Cirsium altissimum	tall thistle
Ruderal	Vascular Plant	Desmodium cuspidatum	toothed tick-trefoil
Ruderal	Reptile	Eumeces anthracinus	coal skink
Ruderal	Vascular Plant	Gnaphalium uliginosum	low cudweed
Ruderal	Vascular Plant	Prunus nigra	Canada plum
Sensitive to Over-Collection	Vascular Plant	Panax trifolius	Dwarf ginseng
Sensitive to Recreation Traffic	Vascular Plant	Sibbaldiopsis tridentata	three-toothed cinquefoil
Standing Dead Trees	Bird	Certhia americana	brown creeper

5.0 Plan Components for Species Diversity

5.1 Introduction

A wide array of species occurs on the GWNF, with many species sharing common habitat requirements that are associated with particular ecological systems. In the revised Forest Plan, the plan components developed for ecosystem diversity are fundamental to providing appropriate ecological conditions for sustaining species diversity. Most species' requirements are met in whole through ecosystem diversity plan components, meaning that provisions in the Plan to restore, maintain, and protect ecological systems are sufficient to sustain plant and animal species on the forest. The first portion of this section describes how species with similar habitat needs are grouped and addressed through plan components for ecosystem diversity.

Although most species on NFS lands will be conserved through the management of healthy and productive ecosystems, even under the best conditions some species require additional attention in the Plan. In the second portion of this section, those species that require further provisions in the Plan are grouped by similar species needs and additional plan components (typically standards) are identified for each species group. With the addition of these plan components, sustainability needs for all species are addressed in the Plan.

5.2 Species Groups Covered by Ecosystem Diversity Plan Components

The GWNF used species groups as an evaluation and analysis tool to improve planning efficiency and for development of management strategies. Species were grouped according to their habitat needs, limiting factors, threats, and specific habitat elements (snags, den trees, woody debris, etc). Many species occurred in multiple groups.

Initial groupings of species were at a broad spatial scale and were based on similar habitats associated with ecosystems. Each group was analyzed by species, and determinations made on whether species needs were fully met by plan components for the associated ecosystems. These groups and the ecosystem(s) with which they are associated are listed in Table 4. Species listed here are considered covered by ecological diversity plan components unless otherwise noted in the species group tables which follow. The ecosystem diversity plan components were described in Section 3.4 of the Ecosystem Diversity Report (USDA Forest Service 2009a). Those species whose needs were not fully addressed by ecosystem plan components were designated in the following summary tables by "N" in the final columns, and further provisions for sustaining the species described in section 4.3.

Table 4. Species group and associated ecological system(s)

Species Group	Associated Ecological System(s)
Cave Associates	Caves and Karstlands
Cliff and Talus Associates	Cliff, Talus and Shale Barrens
Cove Forest Associates	Cove Forest
Fire Dependent Associates	Pine Forests and Woodlands Oak Forests and Woodlands Cove Forests Cliff, Talus and Shale Barrens
Fire Enhanced Associates	Cliff, Talus and Shale Barrens
Hard and Soft Mast Associates	Oak Forests and Woodlands Cove Forests
High Elevation Coniferous, Deciduous and/or Mixed Forest Associates	Pine Forests and Woodlands Oak Forests and Woodlands Cove Forests Northern Hardwood Forests
High Elevation Mature Coniferous Associates	Pine Forests and Woodlands Spruce Fir Forests
High Elevation Open Woodland Associates	Pine Forests and Woodlands Oak Forests and Woodlands Cove Forests
Mafic Rock Associates	Alkaline Glade and Woodlands and Mafic Glades and Barrens
Mature Deciduous Forests Associates	Oak Forests and Woodlands Northern Hardwood Forests Cove Forests
Mature Forest Associates	Pine Forests and Woodlands Oak Forests and Woodlands Cove Forests Northern Hardwood Forests
Northern Hardwood Forests Associates	Northern Hardwood Forest
Open Woodland Associates	Pine Forests and Woodlands Oak Forests and Woodlands Cove Forests
Regenerating Forest Associates	Pine Forests and Woodlands Oak Forests and Woodlands Cove Forests Northern Hardwood Forests
Riparian Area Associates	Floodplains, Wetlands and Riparian Areas
Shale Barren Associates	Cliff, Talus and Shale Barrens
Spruce Fir Associates	Spruce-Fir Forests
Wetland Associates	Floodplains, Wetlands and Riparian Areas
Cave Associates	Caves and Karstlands
Cliff and Talus Associates	Cliff, Talus and Shale Barrens
Cove Forest Associates	Cove Forest
Fire Dependent, Open Woodland and Talus Associates	Pine Forests and Woodlands Oak Forests and Woodlands Cove Forests Cliff, Talus and Shale Barrens
Fire Enhanced Associates	Cliff, Talus and Shale Barrens
Hard and Soft Mast Associates	Oak Forests and Woodlands Cove Forests
High Elevation Coniferous, Deciduous and/or Mixed Forest Associates	Pine Forests and Woodlands Oak Forests and Woodlands Cove Forests Northern Hardwood Forests

Species Group	Associated Ecological System(s)
High Elevation Mature Coniferous Associates	Pine Forests and Woodlands Spruce Fir Forests
High Elevation Open Woodland Associates	Pine Forests and Woodlands Oak Forests and Woodlands Cove Forests
Mafic Rock Associates	Alkaline Glade and Woodlands and Mafic Glades and Barrens
Mature Deciduous Forests Associates	Oak Forests and Woodlands Northern Hardwood Forests Cove Forests
Mature Forest Associates	Pine Forests and Woodlands Oak Forests and Woodlands Cove Forests Northern Hardwood Forests
Northern Hardwood Forests Associates	Northern Hardwood Forest
Open Woodland Associates	Pine Forests and Woodlands Oak Forests and Woodlands Cove Forests

5.2.1 Cave Associates

These species live in caves. Temperature, humidity, water flow, water quality and level of human disturbance are all important components of the cave habitat. Plan components include a desired condition that caves function to maintain groundwater quality and provide habitat for species that depend upon these features. Standards....

Species in Group

Scientific Name	Common Name	Fully Covered By Ecosystem Diversity
<i>Arrhopalites carolynae</i>	Cave springtail	Y
<i>Arrhopalites sacer</i>	Cave springtail	Y
<i>Nampabius turbator</i>	Cave centipede	Y
<i>Neotoma magister</i>	Alleghany woodrat	N
<i>Pseudanophthalmus avernus</i>	Avernus cave beetle	Y
<i>Pseudotremia princeps</i>	South Branch Valley cave millipede	Y
<i>Psuedanophthalmus intersectus</i>	Crossroads cave beetle	Y
<i>Psuedanophthalmus nelsoni</i>	Nelson's cave beetle	Y
<i>Psuedanophthalmus petrunkevitchi</i>	Petrunkevitch's cave beetle	Y
<i>Stygobromus fergusonii</i>	Montgomery County cave amphipod	Y
<i>Stygobromus gracilipes</i>	Shenandoah Valley cave amphipod	Y
<i>Stygobromus hoffmani</i>	Alleghany County cave amphipod	Y
<i>Stygobromus morrisoni</i>	Morrison's cave amphipod	Y
<i>Stygobromus mundus</i>	Bath County cave amphipod	Y
<i>Stygobromus</i> sp. 7	Sherando spinosid	Y

Scientific Name	Common Name	Fully Covered By Ecosystem Diversity
	amphipod	
<i>Trichopetalum weyeriense</i>	Grand Caverns blind cave millipede	Y
<i>Trichopetalum whitei</i>	Luray Caverns blind cave millipede	Y

5.2.2 Cliff and Talus Associates

These species are dependent on cliffs, the talus slopes below cliffs and other talus slopes. The rock substrate is the key component and type of rock can be important to some species.

Species in Group

Scientific Name	Common Name	Fully Covered By Ecosystem Diversity
<i>Aralia hispida</i>	bristly sarsaparilla	Y
<i>Betula cordifolia</i>	mountain paper birch	Y
<i>Cheilanthes eatonii</i>	chestnut lipfern	Y
<i>Cuscuta coryli</i>	hazel dodder	N
<i>Falco peregrinus</i>	peregrine falcon	N
<i>Minuartia groenlandica</i>	mountain sandwort	Y
<i>Paxistima canbyi</i>	Canby's mountain lover	N
<i>Plethodon punctatus</i>	Cow Knob salamander	Y
<i>Plethodon virginia</i>	Shenandoah Mt. salamander	Y
<i>Sibbaldiopsis tridentata</i>	three-toothed cinquefoil	N
<i>Symphoricarpos albus</i>	snowberry	Y
<i>Thuja occidentalis</i>	Northern white cedar	Y

5.2.3 Cove Forest Associates

These species are known to be associated with cove forests.

Species in Group

Common Name	Scientific Name	Fully Covered By Ecosystem Diversity
Carex roanensis	Roan Mountain sedge	N
Leucothoe fontanesiana	highland dog-hobble	N
Oporornis formosus	Kentucky warbler	N
Panax quinquefolius	Ginseng	N
Panax trifolius	Dwarf ginseng	N
Carex roanensis	Roan Mountain sedge	N
Leucothoe fontanesiana	highland dog-hobble	N
Oporornis formosus	Kentucky warbler	N

Common Name	Scientific Name	Fully Covered By Ecosystem Diversity
Panax quinquefolius	Ginseng	N
Panax trifolius	Dwarf ginseng	N

5.2.4 Fire Dependent Associates

These species are generally associated with open woodland conditions that require frequent fires.

Species in Group

Scientific Name	Common Name	Fully Covered By Ecosystem Diversity
Aralia hispida	bristly sarsaparilla	Y
Buckleya distichophylla	Piratebush	N
Carex polymorpha	variable sedge	N
Gaylussacia brachycera	box huckleberry	N

5.2.5 Fire Enhanced Associates

These species are not dependent upon fire, but their habitat is enhanced through frequent fires.

Species in Group

Scientific Name	Common Name	Fully Covered By Ecosystem Diversity
Anaphalis margaritacea	pearly everlasting	N
Bartramia longicauda	upland sandpiper	N
Betula cordifolia	mountain paper birch	Y
Bonasa umbellus	ruffed grouse	N
Bromus kalmii	wild chess	Y
Colinus virginianus	northern bobwhite	N
Echinacea laevigata	smooth coneflower	Y
Elymus trachycaulus	slender wheatgrass	Y
Phlox buckleyi	sword-leaved phlox	N

5.2.6 Hard and Soft Mast Associates

These species need a mixture of both hard and soft mast as food.

Species in Group

Scientific Name	Common Name	Fully Covered By Ecosystem Diversity
Meleagris gallopavo	wild turkey	N
Odocoileus virginianus	white-tailed deer	N

<i>Sciurus carolinensis</i>	gray squirrel	Y
<i>Sciurus niger</i>	Eastern fox squirrel	N
<i>Ursus americanus</i>	black bear	N

5.2.7 High Elevation Coniferous, Deciduous and/or Mixed Forest Associates

These species are generally found at high elevation (>3,000 feet) in forested environments.

Species in Group

Scientific Name	Common Name	Fully Covered By Ecosystem Diversity
<i>Aegolius acadicus</i>	northern saw-whet owl	N
<i>Carex roanensis</i>	Roan Mountain sedge	N
<i>Carpodacus purpureus</i>	purple finch	N
<i>Catharus guttatus</i>	hermit thrush	N
<i>Certhia americana</i>	brown creeper	N
<i>Coccyzus erythrophthalmus</i>	black-billed cuckoo	N
<i>Contopus borealis</i>	olive-sided flycatcher	N
<i>Cornus canadensis</i>	bunchberry	N
<i>Dendroica caerulescens</i>	black-throated blue warbler	N
<i>Dendroica fusca</i>	blackburnian warbler	N
<i>Dendroica magnolia</i>	magnolia warbler	Y
<i>Empidonax alnorum</i>	alder flycatcher	Y
<i>Heuchera alba</i>	white alumroot	N
<i>Hypericum mitchellianum</i>	Blue Ridge St. John's-wort	N
<i>Lepus americanus</i>	snowshoe hare	N
<i>Loxia curvirostra</i>	red crossbill	Y
<i>Martes pennanti</i>	fisher	Y
<i>Microtus chrotorrhinus carolinensis</i>	Southern rock vole	Y
<i>Oporornis philadelphia</i>	mourning warbler	N
<i>Pyrola elliptica</i>	shinleaf	N
<i>Regulus satrapa</i>	golden-crowned kinglet	Y
<i>Schizachne purpurascens</i>	purple oat-grass	Y
<i>Seiurus noveboracensis</i>	northern waterthrush	Y
<i>Sitta canadensis</i>	red-breasted nuthatch	N
<i>Sorex palustris punctulatus</i>	southern water shrew	Y
<i>Sphyrapicus varius</i>	yellow-bellied sapsucker	N
<i>Troglodytes troglodytes</i>	winter wren	N

5.2.8 High Elevation Mature Coniferous Associates

These species are found at high elevations (>3,000 feet) in conifer stands of mature trees (> 60 years in age).

Species in Group

Scientific Name	Common Name	Fully Covered By Ecosystem Diversity
<i>Glaucomys sabrinus fuscus</i>	Virginia northern flying squirrel	Y

5.2.9 High Elevation Open Woodland Associates

These species are found at high elevations (>3,000 feet) in stands of mature trees (> 60 years in age) with an open canopy (24-60 % open) with a well developed grassy understory.

Species in Group

Scientific Name	Common Name	Fully Covered By Ecosystem Diversity
<i>Carpodacus purpureus</i>	purple finch	N
<i>Catharus guttatus</i>	hermit thrush	N
<i>Dendroica caerulescens</i>	black-throated blue warbler	N
<i>Oporornis philadelphia</i>	mourning warbler	N
<i>Sphyrapicus varius</i>	yellow-bellied sapsucker	N

5.2.10 Mafic Rock Associates

These species are associated with mafic rock substrates and often with seepage areas.

Species in Group

Scientific Name	Common Name	Fully Covered By Ecosystem Diversity
<i>Muhlenbergia glomerata</i>	marsh muhly	Y
<i>Oligoneuron rigidum</i>	stiff goldenrod	N
<i>Poa saltuensis</i>	drooping bluegrass	Y
<i>Potentilla arguta</i>	tall cinquefoil	Y
<i>Solidago randii</i> = <i>S. simplex</i> var. <i>randii</i>	Rand's goldenrod	Y

5.2.11 Mature Deciduous Forests Associates

These species are associated with deciduous forested systems generally greater than 60 years of age.

Species in Group

Scientific Name	Common Name	Fully Covered By Ecosystem Diversity
<i>Catocala herodias gerhardi</i>	Herodias underwing	N
<i>Catocala marmorata</i>	Marbled underwing	N
<i>Dendroica cerulea</i>	cerulean warbler	N

<i>Glyptemys insculpta</i>	wood turtle	N
<i>Neotoma magister</i>	Alleghany woodrat	N
<i>Plethodon punctatus</i>	Cow Knob salamander	Y
<i>Plethodon virginia</i>	Shenandoah Mt. salamander	Y
<i>Speyeria diana</i>	Diana fritillary	N

5.2.12 Mature Forest Associates

These species are associated with deciduous or coniferous forested systems generally greater than 60 years of age.

Species in Group

Scientific Name	Common Name	Fully Covered By Ecosystem Diversity
<i>Ambystoma tigrinum</i>	Eastern tiger salamander	Y
<i>Bonasa umbellus</i>	ruffed grouse	N
<i>Meleagris gallopavo</i>	wild turkey	N
<i>Odocoileus virginianus</i>	white-tailed deer	N
<i>Sciurus carolinensis</i>	gray squirrel	Y
<i>Sitta canadensis</i>	red-breasted nuthatch	N
<i>Sphyrapicus varius</i>	yellow-bellied sapsucker	N
<i>Ursus americanus</i>	black bear	N
<i>Vermivora chrysoptera</i>	golden winged warbler	N

5.2.13 Northern Hardwood Forests Associates

The species associated with this group occupy northern hardwood forests.

Species in Group

Scientific Name	Common Name	Fully Covered By Ecosystem Diversity
<i>Pyrola elliptica</i>	shinleaf	N

5.2.14 Open Woodland Associates

These species are associated with mature stands of trees with open (26-60% open) canopies and well developed grassy or shrubby understories.

Species in Group

Scientific Name	Common Name	Fully Covered By Ecosystem Diversity
<i>Callophrys irus</i>	Frosted elfin	N
<i>Caprimulgus carolinensis</i>	chuck-will's widow	N

Scientific Name	Common Name	Fully Covered By Ecosystem Diversity
Caprimulgus vociferus	whip-poor-will	N
Catocala herodias gerhardi	Herodias underwing	N
Colinus virginianus	northern bobwhite	N
Echinacea laevigata	smooth coneflower	Y
Erysimum capitatum	western wallflower	Y
Euchloe olympia	Olympia marble	Y
Eumeces anthracinus	coal skink	N
Helianthemum bicknellii	plains frostweed	N
Houstonia canadensis	Canada bluets	N
Meleagris gallopavo	wild turkey	N
Odocoileus virginianus	white-tailed deer	N
Oporornis formosus	Kentucky warbler	N
Oryzopsis asperifolia	white-grained mtn-ricegrass	N
Plethodon sherando	Big levels salamander	Y
Poa saltuensis	drooping bluegrass	Y
Polygonia progne	Gray comma	N
Pyrgus wyandot	Appalachian grizzled skipper	N
Speyeria diana	Diana fritillary	N
Spiranthes ochroleuca	yellow nodding ladies'-tresses	Y
Trichostema setaceum	narrow-leaved blue curls	Y
Ursus americanus	black bear	N

5.2.15 Regenerating Forest Associates

These species utilize forests in the 0-10 age class group.

Species in Group

Scientific Name	Common Name	Fully Covered By Ecosystem Diversity
Bonasa umbellus	ruffed grouse	N
Caprimulgus carolinensis	chuck-will's widow	N
Caprimulgus vociferus	whip-poor-will	N
Dendroica discolor	prairie warbler	N
Dendroica magnolia	magnolia warbler	Y
Lepus americanus	snowshoe hare	N
Odocoileus virginianus	white-tailed deer	N
Oporornis philadelphia	mourning warbler	N
Ursus americanus	black bear	N

5.2.16 Riparian Area Associates

Species occurring in this group require wetlands, aquatic systems (streams, lakes, or ponds), springs, seeps or areas adjacent to these systems.

Species in Group

Scientific Name	Common Name	Fully Covered By Ecosystem Diversity
<i>Alnus incana</i> ssp. <i>rugosa</i>	speckled alder	Y
<i>Anas rubripes</i>	American black duck	Y
<i>Aster radula</i>	rough-leaved aster	Y
<i>Autochton cellus</i>	Golden-banded skipper	Y
<i>Boloria selene</i>	Silver-bordered fritillary	Y
<i>Bonasa umbellus</i>	ruffed grouse	N
<i>Bromus ciliatus</i>	fringed brome grass	Y
<i>Carex aquatilis</i>	water sedge	Y
<i>Carex arctata</i>	black sedge	Y
<i>Carex vesicaria</i>		Y
<i>Castor canadensis</i>	Beaver	Y
<i>Catocala marmorata</i>	Marbled underwing	N
<i>Cicindela ancocisconensis</i>	a tiger beetle	N
<i>Dendroica cerulea</i>	cerulean warbler	N
<i>Empidonax virescens</i>	acadian flycatcher	Y
<i>Erynnis persius</i>	Persius duskywing	N
<i>Glaucomys sabrinus fuscus</i>	Virginia northern flying squirrel	Y
<i>Glyceria grandis</i>	American manna-grass	Y
<i>Glyptemys insculpta</i>	wood turtle	N
<i>Gnaphalium uliginosum</i>	low cudweed	N
<i>Goodyera repens</i>	dwarf rattlesnake plantain	N
<i>Haliaeetus leucocephalus</i>	bald eagle	N
<i>Hansonoperla appalachia</i>	Appalachian stonefly	Y
<i>Hydraena maureenae</i>	Maureen's shale stream beetle	Y
<i>Isoetes lacustris</i>	lake quillwort	Y
<i>Isonychia tusculanensis</i>	a mayfly	Y
<i>Leuctra mitchellensis</i>	Mitchell needlefly	Y
<i>Leuctra monticola</i>	montane needlefly	Y
<i>Lontra canadensis</i>	river otter	Y
<i>Megaleuctra flinti</i>	Shenandoah needlefly	Y
<i>Microtus chrotorrhinus carolinensis</i>	Southern rock vole	Y
<i>Nemotaulius hostilis</i>	a limnephilid caddisfly	Y
<i>Nyctanassa violacea</i>	yellow-crowned night-heron	Y
<i>Nycticorax nycticorax</i>	black-crowned night-heron	Y
<i>Paragnetina ishusha</i>	widecollar stonefly	Y
<i>Paraleptophlebia jeanae</i>	a mayfly	Y
<i>Peltigera hydrothyria</i>	Waterfan	Y
<i>Perlesta frisoni</i>	Blue Ridge stonefly	Y
<i>Phycoides cocyta</i>	Northern pearl crescent	Y
<i>Platanthera peramoena</i>	purple fringeless orchid	Y
<i>Poa palustris</i>	fowl bluegrass	Y
<i>Polygonia progne</i>	Gray comma	N
<i>Potamogeton oakesianus</i>	Oakes pondweed	Y
<i>Potamogeton tennesseensis</i>	Tennessee pondweed	Y
<i>Sciurus carolinensis</i>	gray squirrel	Y

Scientific Name	Common Name	Fully Covered By Ecosystem Diversity
<i>Scolopax minor</i>	American woodcock	N
<i>Solidago rupestris</i>	riverbank goldenrod	Y
<i>Sorex palustris punctulatus</i>	southern water shrew	Y
<i>Vitis rupestris</i>	sand grape	Y

5.2.17 Shale Barren Associates

Species occurring in this group require shale barrens.

Species in Group

Scientific Name	Common Name	Fully Covered By Ecosystem Diversity
<i>Arabis serotina</i>	shale barren rockcress	Y
<i>Astragalus distortus</i>	bent milkvetch	Y
<i>Bromus kalmii</i>	wild chess	Y
<i>Cheilanthes eatonii</i>	chestnut lipfern	Y
<i>Clematis viticaulis</i>	Millboro leatherflower	Y
<i>Elymus trachycaulus</i>	slender wheatgrass	Y
<i>Erysimum capitatum</i>	western wallflower	Y
<i>Euchloe olympia</i>	Olympia marble	Y
<i>Liatris turgida</i>	shale -barren blazing star	Y
<i>Oenothera argillicola</i>	Shale-barren evening primrose	Y
<i>Paronychia virginica</i>	yellow nailwort	N
<i>Phycoides coccyta</i>	Northern pearl crescent	Y
<i>Pyrgus wyandot</i>	Appalachian grizzled skipper	N
<i>Taenidia montana</i>	Virginia mountain pimpernel	Y
<i>Trichostema setaceum</i>	narrow-leaved blue curls	Y
<i>Viola pedatifida</i>	prairie violet	Y

5.2.18 Spruce Fir Associates

These species are known to be associated with spruce-fir forests.

Species in Group

Scientific Name	Common Name	Fully Covered By Ecosystem Diversity
<i>Gymnocarpium appalachianum</i>	Appalachian oak fern	N

5.2.19 Wetland Associates

These are species that inhabit wetland systems.

Species in Group

Scientific Name	Common Name	Fully Covered By Ecosystem Diversity
<i>Aegolius acadicus</i>	northern saw-whet owl	N
<i>Ambystoma tigrinum</i>	Eastern tiger salamander	Y
<i>Boltonia montana</i>	no common name	Y
<i>Buxbaumia minakatae</i>	Bug-on-a-stick moss	Y
<i>Calopogon tuberosus</i>	Grass pink	Y
<i>Carex barrattii</i>	Barratt's sedge	Y
<i>Carex buxbaumii</i>	Buxbaum's sedge	Y
<i>Carex lasiocarpa</i> var. <i>americana</i>	slender sedge	Y
<i>Castor canadensis</i>	Beaver	Y
<i>Certhia americana</i>	brown creeper	N
<i>Clemmys guttata</i>	spotted turtle	Y
<i>Coccyzus erythrophthalmus</i>	black-billed cuckoo	N
<i>Colias interior</i>	Pink-edged sulphur	Y
<i>Contopus borealis</i>	olive-sided flycatcher	N
<i>Cypripedium reginae</i>	showy lady's-slipper	Y
<i>Dendroica magnolia</i>	magnolia warbler	Y
<i>Echinodorus tenellus</i>	dwarf burhead	Y
<i>Eleocharis compressa</i>	flat-stemmed spikerush	Y
<i>Eleocharis melanocarpa</i>	black-fruited spikerush	Y
<i>Eleocharis robbinsii</i>	Robbins spikerush	Y
<i>Empidonax alnorum</i>	alder flycatcher	Y
<i>Epilobium leptophyllum</i>	linear-leaved willow-herb	Y
<i>Equisetum sylvaticum</i>	woodland horsetail	Y
<i>Eriocaulon aquaticum</i>	white buttons	Y
<i>Glyceria grandis</i>	American manna-grass	Y
<i>Helenium virginicum</i>	Virginia sneezeweed	Y
<i>Helonias bullata</i>	swamp-pink	Y
<i>Hypericum boreale</i>	northern St. John's-wort	N
<i>Ixobrychus exilis exilis</i>	least bittern	Y
<i>Juncus brachycephalus</i>	small-head rush	Y
<i>Juncus brevicaudatus</i>	narrow-panicked rush	Y
<i>Liparis loeselii</i>	Loesel's twayblade	Y
<i>Melospiza georgiana</i>	swamp sparrow	N
<i>Muhlenbergia glomerata</i>	marsh muhly	Y
<i>Orontium aquaticum</i>	Golden club	Y
<i>Osmunda cinnamomea</i> var. <i>glandulosa</i>	glandular cinnamon fern	Y
<i>Panicum hemitomon</i>	maidencane	Y
<i>Parnassia grandifolia</i>	Large-leaved grass-of-parnassus	Y
<i>Poa paludigena</i>	bog bluegrass	Y
<i>Polygonia progne</i>	Gray comma	N

Scientific Name	Common Name	Fully Covered By Ecosystem Diversity
<i>Rallus elegans</i>	King rail	Y
<i>Ribes americanum</i>	wild black currant	Y
<i>Sabatia campanulata</i>	slender marsh rose-pink	Y
<i>Sagittaria calycina</i> var <i>calycina</i>	long-lobed arrowhead	Y
<i>Schizachne purpurascens</i>	purple oat-grass	Y
<i>Schoenoplectus subterminalis</i>	water bulrush	Y
<i>Scirpus ancistrochaetus</i>	northeastern bulrush	Y
<i>Scolopax minor</i>	American woodcock	N
<i>Seiurus noveboracensis</i>	northern waterthrush	Y
<i>Solidago uliginosa</i>	bog goldenrod	Y
<i>Sparganium chlorocarpum</i> = <i>S. emersum</i>	narrow-leaf burreed	Y
<i>Speyeria atlantis</i>	Atlantis fritillary	Y
<i>Sphagnum russowii</i>	Russow's peatmoss	Y
<i>Sphyrapicus varius</i>	yellow-bellied sapsucker	N
<i>Spiranthes ochroleuca</i>	yellow nodding ladies'-tresses	Y
<i>Triantha racemosa</i>	coastal false-asphodel	Y
<i>Trillium pusillum</i> var. <i>virginianum</i>	mountain least trillium	Y
<i>Troglodytes troglodytes</i>	winter wren	N
<i>Vaccinium macrocarpon</i>	large cranberry	Y
<i>Vermivora chrysoptera</i>	golden winged warbler	N
<i>Woodwardia virginica</i>	Virginia chainfern	Y

5.2.20 Species with Habitat in Special Biologic Areas

These are species that occupy habitat that has been designated as special biologic areas. These areas are established with the goal to manage the area for the particular rare communities or species at the site.

Species in Group

Scientific Name	Common Name	Fully Covered By Ecosystem Diversity
<i>Aegolius acadicus</i>	northern saw-whet owl	N
<i>Ambystoma tigrinum</i>	Eastern tiger salamander	Y
<i>Anaphalis margaritacea</i>	pearly everlasting	N
<i>Arabis serotina</i>	shale barren rockcress	Y
<i>Aralia hispida</i>	bristly sarsaparilla	Y
<i>Betula cordifolia</i>	mountain paper birch	Y
<i>Boloria selene</i>	Silver-bordered fritillary	Y
<i>Boltonia montana</i>	no common name	Y
<i>Bromus kalmii</i>	wild chess	Y
<i>Carex aquatilis</i>	water sedge	Y
<i>Carex arctata</i>	black sedge	Y
<i>Carex barrattii</i>	Barratt's sedge	Y
<i>Carex buxbaumii</i>	Buxbaum's sedge	Y

Scientific Name	Common Name	Fully Covered By Ecosystem Diversity
<i>Carex lasiocarpa</i> var. <i>americana</i>	slender sedge	Y
<i>Carex polymorpha</i>	variable sedge	N
<i>Carex roanensis</i>	Roan Mountain sedge	N
<i>Carex vesicaria</i>		Y
<i>Carpodacus purpureus</i>	purple finch	N
<i>Catharus guttatus</i>	hermit thrush	N
<i>Certhia americana</i>	brown creeper	N
<i>Cheilanthes eatonii</i>	chestnut lipfern	Y
<i>Cicindela patruela</i>	Barrens tiger beetle	N
<i>Cirsium altissimum</i>	tall thistle	N
<i>Clematis viticaulis</i>	Millboro leatherflower	Y
<i>Clemmys guttata</i>	spotted turtle	Y
<i>Colias interior</i>	Pink-edged sulphur	Y
<i>Contopus borealis</i>	olive-sided flycatcher	N
<i>Cornus canadensis</i>	bunchberry	N
<i>Cornus rugosa</i>	roundleaf dogwood	N
<i>Cuscuta rostrata</i>	beaked dodder	N
<i>Cypripedium reginae</i>	showy lady's-slipper	Y
<i>Dendroica fusca</i>	blackburnian warbler	N
<i>Dendroica magnolia</i>	magnolia warbler	Y
<i>Desmodium cuspidatum</i>	toothed tick-trefoil	N
<i>Echinacea laevigata</i>	smooth coneflower	Y
<i>Echinodorus tenellus</i>	dwarf burhead	Y
<i>Eleocharis melanocarpa</i>	black-fruited spikerush	Y
<i>Eleocharis robbinsii</i>	Robbins spikerush	Y
<i>Elymus trachycaulus</i>	slender wheatgrass	Y
<i>Empidonax alnorum</i>	alder flycatcher	Y
<i>Epilobium leptophyllum</i>	linear-leaved willow-herb	Y
<i>Equisetum sylvaticum</i>	woodland horsetail	Y
<i>Eriocaulon aquaticum</i>	white buttons	Y
<i>Erynnis martialis</i>	Mottled duskywing	N
<i>Erysimum capitatum</i>	western wallflower	Y
<i>Gaylussacia brachycera</i>	box huckleberry	N
<i>Glaucomys sabrinus fuscus</i>	Virginia northern flying squirrel	Y
<i>Glyceria grandis</i>	American manna-grass	Y
<i>Gnaphalium uliginosum</i>	low cudweed	N
<i>Gymnocarpium appalachianum</i>	Appalachian oak fern	N
<i>Helenium virginicum</i>	Virginia sneezeweed	Y
<i>Helianthemum bicknellii</i>	plains frostweed	N
<i>Helonias bullata</i>	swamp-pink	Y
<i>Heuchera alba</i>	white alumroot	N
<i>Houstonia canadensis</i>	Canada bluets	N
<i>Hypericum mitchellianum</i>	Blue Ridge St. John's-wort	N
<i>Isoetes lacustris</i>	lake quillwort	Y
<i>Juncus brachycephalus</i>	small-head rush	Y
<i>Juncus brevicaudatus</i>	narrow-panicked rush	Y
<i>Juniperus communis</i> var. <i>depressa</i>	ground juniper	N

Scientific Name	Common Name	Fully Covered By Ecosystem Diversity
<i>Lepus americanus</i>	snowshoe hare	N
<i>Leucothoe fontanesiana</i>	highland dog-hobble	N
<i>Liparis loeselii</i>	Loesel's twayblade	Y
<i>Minuartia groenlandica</i>	mountain sandwort	Y
<i>Monotropsis odorata</i>	sweet pinesap	N
<i>Muhlenbergia glomerata</i>	marsh muhly	Y
<i>Oligoneuron rigidum</i>	stiff goldenrod	N
<i>Orontium aquaticum</i>	Golden club	Y
<i>Oryzopsis asperifolia</i>	white-grained mtn-ricegrass	N
<i>Osmunda cinnamomea</i> var. <i>glandulosa</i>	glandular cinnamon fern	Y
<i>Panicum hemitomon</i>	maidencane	Y
<i>Phlox buckleyi</i>	sword-leaved phlox	N
<i>Platanthera grandiflora</i>	large purple fringed orchid	Y
<i>Plethodon punctatus</i>	Cow Knob salamander	Y
<i>Plethodon sherando</i>	Big levels salamander	Y
<i>Plethodon virginia</i>	Shenandoah Mt. salamander	Y
<i>Poa palustris</i>	fowl bluegrass	Y
<i>Poa saltuensis</i>	drooping bluegrass	Y
<i>Polygonia progne</i>	Gray comma	N
<i>Potamogeton oakesianus</i>	Oakes pondweed	Y
<i>Potentilla arguta</i>	tall cinquefoil	Y
<i>Pyrgus wyandot</i>	Appalachian grizzled skipper	N
<i>Pyrola elliptica</i>	shinleaf	N
<i>Ribes americanum</i>	wild black currant	Y
<i>Rubus idaeus</i> ssp. <i>strigosus</i>	American red raspberry	N
<i>Sabatia campanulata</i>	slender marsh rose-pink	Y
<i>Sagittaria calycina</i> var. <i>calycina</i>	long-lobed arrowhead	Y
<i>Schizachne purpurascens</i>	purple oat-grass	Y
<i>Schoenoplectus subterminalis</i>	water bulrush	Y
<i>Scirpus ancistrochaetus</i>	northeastern bulrush	Y
<i>Sibbaldiopsis tridentata</i>	three-toothed cinquefoil	N
<i>Solidago randii</i> = <i>S. simplex</i> var. <i>randii</i>	Rand's goldenrod	Y
<i>Solidago rupestris</i>	riverbank goldenrod	Y
<i>Solidago uliginosa</i>	bog goldenrod	Y
<i>Sorex palustris punctulatus</i>	southern water shrew	Y
<i>Sparganium chlorocarpum</i> = <i>S. emersum</i>	narrow-leaf burreed	Y
<i>Speyeria atlantis</i>	Atlantis fritillary	Y
<i>Sphagnum russowii</i>	Russow's peatmoss	Y
<i>Spiranthes ochroleuca</i>	yellow nodding ladies'-tresses	Y
<i>Symphoricarpos albus</i>	snowberry	Y
<i>Thuja occidentalis</i>	Northern white cedar	Y
<i>Triantha racemosa</i>	coastal false-asphodel	Y
<i>Trichostema setaceum</i>	narrow-leaved blue curls	Y
<i>Trillium pusillum</i> var. <i>virginianum</i>	mountain least trillium	Y

Scientific Name	Common Name	Fully Covered By Ecosystem Diversity
<i>Triphora trianthophora</i>	nodding pogonia	N
<i>Vaccinium macrocarpon</i>	large cranberry	Y
<i>Viola pedatifida</i>	prairie violet	Y
<i>Vitis rupestris</i>	sand grape	Y
<i>Woodwardia virginica</i>	Virginia chainfern	Y

5.3 Species Groups Requiring Additional Plan Components

This section provides details on groups of species that required further plan components in addition to those already provided by ecological diversity. Management strategies and appropriate plan components are described for each group. These groups represent small spatial scales and groups of species associated with localized conditions and features that cross ecosystem boundaries.

5.3.1 Open Area Associates

Many species require open areas for at least some part of their life history. Openings allow sunlight to reach the ground and that often allows for more herbaceous vegetation and shrubby vegetation to become established. Herbaceous vegetation also allows for development of a richer insect population which can provide food which is often important for the early portion of several species lives. Open areas can take many forms. A stand of trees that is harvested, blown down, burned up by fire creates an opening while the new stand regenerates. The opening for the first ten years is referred to as early successional habitat and is important for many species as a temporary opening. As the stand continues to grow, the dense stand of saplings in the range of 11 to 20 years provides habitat important to ruffed grouse. Openings can be as small as the opening created by a tree falling (canopy gaps) or as large as grasslands greater than 100 acres in size which are desired by Henslow's sparrows. If disturbance of an area occurs on a regular basis, trees will not be reestablished on the site. It may stay as a grassland with very frequent disturbance or as a shrubland with less frequent disturbance. Open woodlands are created when fire is frequent in a mature stand of trees. The few mature trees will maintain an open canopy, but the understory will be open enough for a grassy or herbaceous understory will develop that can be maintained with frequent fire. These openings are sometimes hard to distinguish from each other and they may move from one type to another depending upon the type and frequency of disturbance.

Plan Components

All of these types of opening are important. The following are the species groups associated with the various types of openings. Because these openings blend into one another, the plan components need for these species groups are described here:

- Maintain approximately 2-5 % of the Forest in openings (maintained openings, regenerating forests, open forests, grasslands, shrublands, non-forested wetlands or open woodlands).

- Maintain old fields, short/medium/tall grasslands at old farm tracts at Hidden Valley, Evans Tract, Wallace Tract, Marshall Tract, Whitting Tract, Cullers Tract Moody Tract, and Zepp Tannery
- Maintain some of the above areas in tracts 100 acres or larger in size.
- Objective: Maintain or create old fields or clusters of maintained openings (1-5 acres in size) on sites greater than 2,000 feet elevation on at least fifteen sites around the forest.

Management Strategies

5.3.1a Area Sensitive Grasslands, Shrublands, Open Wetlands And/Or Open Woodlands Associates

These species require the presence of large blocks (from 40 to 100 acres) of open habitat in the form of grasslands, shrublands open wetlands or open woodlands. Some species rely on only one of these components, others can utilize any of them. It is important to retain existing sites and expand them where possible.

Species in Group

Scientific Name	Common Name	Fully Covered By Ecosystem Diversity
<i>Ammodramus henslowii</i>	Henslow's sparrow	N
<i>Bartramia longicauda</i>	upland sandpiper	N
<i>Caprimulgus carolinensis</i>	chuck-will's widow	N
<i>Caprimulgus vociferus</i>	whip-poor-will	N
<i>Cicindela patruela</i>	Barrens tiger beetle	N
<i>Circus cyaneus</i>	northern harrier	N
<i>Colinus virginianus</i>	northern bobwhite	N
<i>Dendroica discolor</i>	prairie warbler	N
<i>Erynnis martialis</i>	Mottled duskywing	N
<i>Haliaeetus leucocephalus</i>	bald eagle	N
<i>Lanius ludovicianus</i>	loggerhead shrike	N
<i>Melanerpes erythrocephalus</i>	red-headed woodpecker	N
<i>Sciurus niger</i>	Eastern fox squirrel	N
<i>Speyeria idalia</i>	Regal fritillary	N
<i>Tyto alba</i>	barn owl	N
<i>Vermivora chrysoptera</i>	golden winged warbler	N

5.3.1.b High Elevation Openings, Grassy Or Shrubby Openings Associates

These species.

Species in Group

Scientific Name	Common Name	Fully Covered By Ecosystem Diversity
<i>Carpodacus purpureus</i>	purple finch	N
<i>Catharus guttatus</i>	hermit thrush	N
<i>Coccyzus erythrophthalmus</i>	black-billed cuckoo	N
<i>Contopus borealis</i>	olive-sided flycatcher	N
<i>Cuscuta rostrata</i>	beaked dodder	N
<i>Gnaphalium uliginosum</i>	low cudweed	N
<i>Hypericum mitchellianum</i>	Blue Ridge St. John's-wort	N
<i>Juniperus communis</i> var <i>depressa</i>	ground juniper	N
<i>Lepus americanus</i>	snowshoe hare	N
<i>Melospiza georgiana</i>	swamp sparrow	N
<i>Rubus idaeus</i> ssp. <i>strigosus</i>	American red raspberry	N
<i>Thryomanes bewickii altus</i>	Appalachian Bewick's wren	N
<i>Vermivora chrysoptera</i>	golden winged warbler	N

5.3.1.c Opening Associates

These species.

Species in Group

Scientific Name	Common Name	Fully Covered By Ecosystem Diversity
<i>Anaphalis margaritacea</i>	pearly everlasting	N
<i>Cicindela patruela</i>	Barrens tiger beetle	N
<i>Erynnis persius</i>	Persius duskywing	N
<i>Glyptemys insculpta</i>	wood turtle	N
<i>Oryzopsis asperifolia</i>	white-grained mtn-ricegrass	N
<i>Bonasa umbellus</i>	ruffed grouse	N
<i>Cicindela patruela</i>	Barrens tiger beetle	N
<i>Eumeces anthracinus</i>	coal skink	N
<i>Meleagris gallopavo</i>	wild turkey	N
<i>Odocoileus virginianus</i>	white-tailed deer	N
<i>Polygonia progne</i>	Gray comma	N
<i>Speyeria idalia</i>	Regal fritillary	N
<i>Ursus americanus</i>	black bear	N

5.3.1.d Grassland Associates

These species.

Species in Group

Scientific Name	Common Name	Fully Covered By Ecosystem Diversity
<i>Scolopax minor</i>	American woodcock	N

5.3.1.e Grassland, Shrubland, and/or Open Woodland Associates

These species.

Species in Group

Scientific Name	Common Name	Fully Covered By Ecosystem Diversity
<i>Mustela nivalis</i>	least weasel	N

5.3.1.d Old Field Associates

These species.

Species in Group

Scientific Name	Common Name	Fully Covered By Ecosystem Diversity
<i>Colinus virginianus</i>	northern bobwhite	N
<i>Juniperus communis</i> var <i>depressa</i>	ground juniper	N
<i>Lanius ludovicianus</i>	loggerhead shrike	N
<i>Meleagris gallopavo</i>	wild turkey	N
<i>Mustela nivalis</i>	least weasel	N
<i>Prunus nigra</i>	Canada plum	N
<i>Speyeria idalia</i>	Regal fritillary	N
<i>Thryomanes bewickii altus</i>	Appalachian Bewick's wren	N
<i>Tyto alba</i>	barn owl	N
<i>Vermivora chrysoptera</i>	golden winged warbler	N

5.3.1.e Canopy Gap and Opening Associates

These species.

Species in Group

Scientific Name	Common Name	Fully Covered By Ecosystem Diversity
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Plan Components for Species Diversity

<i>Dendroica cerulea</i>	cerulean warbler	N
<i>Dendroica fusca</i>	blackburnian warbler	N
<i>Neotoma magister</i>	Alleghany woodrat	N
<i>Oporornis formosus</i>	Kentucky warbler	N
<i>Scolopax minor</i>	American woodcock	N

5.3.2 Cavity or Den Tree Associates

Den trees include live hardwood trees and cavities and can be found in a variety of tree species including pines. The species in this group require cavities or den trees for reproduction, shelter, and/or hibernation.

Species in Group

The following species are included in the den tree associates group:

Scientific Name	Common Name	Fully Covered By Ecosystem Diversity
<i>Aegolius acadicus</i>	northern saw-whet owl	N
<i>Contopus borealis</i>	olive-sided flycatcher	N
<i>Sitta canadensis</i>	red-breasted nuthatch	N
<i>Sphyrapicus varius</i>	yellow-bellied sapsucker	N
<i>Tyto alba</i>	barn owl	N
<i>Ursus americanus</i>	black bear	N

Plan Components

Ecosystem diversity plan components include desired conditions for managed forest to provide habitat for denning and cavity nesting species. Rock falls, caves, uprooted trees, and cavity trees of all sizes serve as suitable nesting and denning sites.

The following standards apply to den tree associates:

- Active and potential black bear den trees should be retained during all vegetation management treatments. Potential den trees are those that are greater than 20" diameter breast height. Potential den trees also include those that are hollow with broken tops or those with limbs greater than 12 inches diameter broken near the bole of the tree.
- Indiana-bat standards
- Cavity Trees

Management Strategies

The key characteristics for this group are recruitment of new den/cavity trees and retention of existing trees. Both of these can be measured through implementation monitoring using standards. Artificial cavity installation may be necessary for some of these species. Partnerships may enhance improvement of den tree species sustainability on the Forest.

5.3.3 Downed Wood Associates

Species in this associations require downed wood, for some vital part of their life history. Downed wood provides shelter for many species and their prey items. Downed wood is vital habitat for the.

Species in Group

The following species are included in the downed wood and stump associates group:

Scientific Name	Common Name	Fully Covered By Ecosystem Diversity
Helicodiscus diadema	Shaggy coil	N
Paravitrea reesi	Round supercoil	N

Plan Components

Forest-wide desired conditions as well as desired conditions for each forested ecological system and species diversity serve as ecosystem diversity plan components for these species. Objectives in the Plan to restore or maintain mature and old-growth forest help to sustain these species.

Although ecosystem diversity plan components should supply ample amounts of suitable habitat, there are additional needs for this group. Given that past management practices have allowed for the removal of stumps, it is necessary to create additional plan components for their retention. Plan provisions to retain these habitat elements help to insure species sustainability.

The following standards apply to this species group:

- Dead and downed logs or other woody debris should generally not be removed from rare communities. Where needed to ensure public or employee safety, snags may be felled, but will be retained within the community as downed wood.
-

Management Strategies

The major strategy for this group is the recruitment of new downed wood, and retention of existing ones at the project level. Retention and recruitment can be measured through implementation monitoring and standards. One assumption made for this group is that abundance of these habitat elements can be indirectly measured by the presence of mature and old growth forest and woodland. Sustainable amounts of mature and old-growth forest in combination with retention standards provide downed wood into ecological systems. Although fire can destroy downed wood on the ground, it should not be excluded from use. Plan guidance limits direct firing and suggests that only low intensity flames should be used in these areas. Although fire may destroy some downed wood used by this species, having a sustainable supply of downed wood recruited into the system by a mature forest should be sufficient to sustain the species.

5.3.5 Lepidopterans

These are species of lepidopterans that have sensitivity to fire and to treatment of invasive insects such as gypsy moth. Many of these species rely on host plants that rely on open conditions, so fire is an important aspect of maintaining their habitat. However, since at least one of their life stages is always present in the area, care must be taken in planning prescribed burns. In addition, these species can be sensitive to insecticides used to suppress populations of gypsy moth.

Species in Group

The following species are included in the species sensitive to fire injury group:

Scientific Name	Common Name	Fully Covered By Ecosystem Diversity

Plan Components

These species are partially covered by plan components for mesic ecological systems, including those related to fire, which indicate only low intensity fire should be used. However, species in this group are especially sensitive to the direct effects of fire, and care should be taken whenever fire is used in areas where they are known to occur. There are no direct key characteristics for this group, however project monitoring can determine if damage is occurring to species. These species are limited in occurrence on the GWNF, therefore implementation of special provisions at the project level should not interfere with completion of work.

The following standards specific to these species were developed and included in the revised Forest Plan:

- Planning and implementation of prescribed burns should include measures to provide protection for known occurrences of T&E, sensitive and locally rare species that are

susceptible to damage or extirpation from fire injury. This group is referred to as “species sensitive to fire injury.”

- Planning and implementation of road construction, fireline construction, wildlife pond and opening construction, timber harvests, and other ground disturbing projects should include appropriate measures to provide protection for known occurrences of rare species.

Management Strategies

When developing burn plans, the following should be considered at a minimum for all species in this group:

- Is any species from this group present or have potential to be present in project area?
- Is species habitat present in project area?
- What are the negative effects of fire to species?
- What mitigation can be performed to reduce impacts to species, i.e.. burning during specific part of life-cycle (hibernation, non-breeding, dormancy, etc); protecting individuals from direct effects of fire; protecting duff layer in mesic areas; etc.?
- Are there sufficient populations of this species adjacent to the project area to re-populate after the project?
- Are there any additional techniques that can be used to reduce impacts?
- Consideration of and mitigation for these questions should provide for species in this group.

5.3.6 Species Sensitive to Over-Collection

Species in this group are sensitive to excessive collection which could lead to sharp population declines. These species are collected commercially and used for a variety of purposes including food, medicinal, decorative, gardening / landscaping, pet trade, and trophy hunting (rattle collection).

Species in Group

The following species are included in the species sensitive to over-collection group:

Scientific Name	Common Name	Fully Covered By Ecosystem Diversity
<i>Panax quinquefolius</i>	Ginseng	N
<i>Panax trifolius</i>	Dwarf ginseng	N
<i>Pyrgus wyandot</i>	Appalachian grizzled skipper	N
<i>Speyeria diana</i>	Diana fritillary	N
<i>Speyeria idalia</i>	Regal fritillary	N

Plan Components

Plan components include species diversity desired conditions and the following standards to limit collection of species occurring within rare communities to approved scientific purposes only:

All species on this list occur outside of rare and wetland communities. There are no ecosystem diversity plan components which cover these species. Species diversity desired conditions state that “Species have robust populations that persist over time.”

The following standard applies to this species group:

- Planning and implementation of road construction, fireline construction, wildlife pond and opening construction, timber harvests, and other ground disturbing projects should include measures to provide protection for T&E, sensitive and locally rare species that are susceptible to damage or extirpation from ground disturbance. These are referred to as “species sensitive to soil disturbance” and “species sensitive to recreational traffic.”

Management Strategies

The strategy for these species is to continue to educate the public on species needs, restrict access to rare or sensitive populations, increase road ecopassage, and implement standards to protect these species where they occur during projects that involve heavy equipment or ground disturbance. New roads and trails should be located to avoid populations of these species and existing roads and trails should be evaluated for closure if they are causing declines to populations. Many roads on the Forest are not under our control, so partnerships and collaborative efforts may be required to help sustain species in this group.

5.3.8 Rock Outcrop Associates

These species.

Species in Group

Scientific Name	Common Name	Fully Covered By Ecosystem Diversity
<i>Helianthemum bicknellii</i>	plains frostweed	N
<i>Houstonia canadensis</i>	Canada bluets	N
<i>Neotoma magister</i>	Alleghany woodrat	N
<i>Thryomanes bewickii altus</i>	Appalachian Bewick's wren	N
<i>Oligoneuron rigidum</i>	stiff goldenrod	N
<i>Paronychia virginica</i>	yellow nailwort	N
<i>Paxistima canbyi</i>	Canby's mountain lover	N

Plan Components

Management Strategies

5.3.9 Dense, shrubby Understory Associates

These species.

Species in Group

Scientific Name	Common Name	Fully Covered By Ecosystem Diversity
<i>Dendroica caerulescens</i>	black-throated blue warbler	N
<i>Oporornis formosus</i>	Kentucky warbler	N
<i>Troglodytes troglodytes</i>	winter wren	N

Plan Components

Management Strategies

5.3.10 Calciphiles

These species.

Species in Group

Scientific Name	Common Name	Fully Covered By Ecosystem Diversity
<i>Arrhopalites carolynae</i>	Cave springtail	Y
<i>Arrhopalites sacer</i>	Cave springtail	Y
<i>Desmodium cuspidatum</i>	toothed tick-trefoil	N
<i>Echinacea laevigata</i>	smooth coneflower	Y
<i>Helicodiscus diadema</i>	Shaggy coil	N
<i>Houstonia canadensis</i>	Canada bluets	N
<i>Juniperus communis</i> var <i>depressa</i>	ground juniper	N
<i>Lithospermum latifolium</i>	American gromwell	N
<i>Nampabius turbator</i>	Cave centipede	Y
<i>Oligoneuron rigidum</i>	stiff goldenrod	N
<i>Paravitrea reesi</i>	Round supercoil	N
<i>Paronychia virginica</i>	yellow nailwort	N
<i>Paxistima canbyi</i>	Canby's mountain lover	N
<i>Pseudanophthalmus avernus</i>	Avernus cave beetle	Y
<i>Pseudotremia princeps</i>	South Branch Valley cave millipede	Y
<i>Psuedanophthalmus intersectus</i>	Crossroads cave beetle	Y
<i>Psuedanophthalmus nelsoni</i>	Nelson's cave beetle	Y
<i>Psuedanophthalmus petrunkevitchi</i>	Petrunkevitch's cave beetle	Y
<i>Stygobromus fergusoni</i>	Montgomery County cave amphipod	Y

<i>Stygobromus gracilipes</i>	Shenandoah Valley cave amphipod	Y
<i>Stygobromus hoffmani</i>	Alleghany County cave amphipod	Y
<i>Stygobromus morrisoni</i>	Morrison's cave amphipod	Y
<i>Stygobromus mundus</i>	Bath County cave amphipod	Y
<i>Stygobromus</i> sp. 7	Sherando spinosid amphipod	Y
<i>Symphoricarpos albus</i>	snowberry	Y
<i>Thuja occidentalis</i>	Northern white cedar	Y
<i>Trichopetalum weyeriensis</i>	Grand Caverns blind cave millipede	Y
<i>Trichopetalum whitei</i>	Luray Caverns blind cave millipede	Y
<i>Zigadenus elegans</i> ssp. <i>glaucus</i> = <i>Anticlea glauca</i>	white camas	N

Plan Components

Management Strategies

5.3.11 Ruderal Associates

These species are associated with previously disturbed habitats like old fields, old homesites and roadsides.

Species in Group

Scientific Name	Common Name	Fully Covered By Ecosystem Diversity
<i>Cicindela patruela</i>	Barrens tiger beetle	N
<i>Cirsium altissimum</i>	tall thistle	N
<i>Desmodium cuspidatum</i>	toothed tick-trefoil	N
<i>Eumeces anthracinus</i>	coal skink	N
<i>Gnaphalium uliginosum</i>	low cudweed	N
<i>Phlox buckleyi</i>	sword-leaved phlox	N
<i>Prunus nigra</i>	Canada plum	N

Plan Components

Management Strategies

5.3.12 High Elevation Boulderfield Associates

These species.

Species in Group

Scientific Name	Common Name	Fully Covered By Ecosystem Diversity
Cornus rugosa	roundleaf dogwood	N
Heuchera alba	white alumroot	N

Plan Components**Management Strategies****5.3.14 Standing Dead Tree Associates**

These species.

Species in Group

Scientific Name	Common Name	Fully Covered By Ecosystem Diversity
Certhia americana	brown creeper	N

Plan Components**Management Strategies****5.3.15 Leaf Litter Associates**

These species.

Species in Group

Scientific Name	Common Name	Fully Covered By Ecosystem Diversity
Helicodiscus diadema	Shaggy coil	N
Paravitrea reesi	Round supercoil	N

Plan Components

Management Strategies

5.3.14 Species Needing Occurrence Protection

Species in this group are rare in occurrence on the GWNF although habitat is widespread. Habitat assessments can not accurately predict the presence of these species. Most of these species occur in less than 5 populations on the Forest and are sensitive to management actions. Those species which have more than 5 known occurrences represent populations which are critical to the survival of the species and have limited occurrence outside of GWNF. T&E species are not included in this group because they require species-specific protection and have specific guidance described in Section 2.

Species in Group

The following species are included in the species needing occurrence protection group:

Scientific Name	Common Name	Forest Distribution (Number of Occurrences)
<i>Adlumia fungosa</i>	Climbing fumatory	N
<i>Ammodramus henslowii</i>	Henslow's sparrow	N
<i>Buckleya distichophylla</i>	Piratebush	N
<i>Carex polymorpha</i>	variable sedge	N
<i>Carex roanensis</i>	Roan Mountain sedge	N
<i>Catocala herodias gerhardi</i>	Herodias underwing	N
<i>Catocala marmorata</i>	Marbled underwing	N
<i>Corallorhiza bentleyi</i>	Bentley's coalroot	N
<i>Cornus canadensis</i>	bunchberry	N
<i>Cornus rugosa</i>	roundleaf dogwood	N
<i>Cuscuta coryli</i>	hazel dodder	N
<i>Cuscuta rostrata</i>	beaked dodder	N
<i>Desmodium cuspidatum</i>	toothed tick-trefoil	N
<i>Eumeces anthracinus</i>	coal skink	N
<i>Falco peregrinus</i>	peregrine falcon	N
<i>Gaylussacia brachycera</i>	box huckleberry	N
<i>Goodyera repens</i>	dwarf rattlesnake plantain	N
<i>Gymnocarpium appalachianum</i>	Appalachian oak fern	N
<i>Haliaeetus leucocephalus</i>	bald eagle	N
<i>Heuchera alba</i>	white alumroot	N
<i>Hypericum mitchellianum</i>	Blue Ridge St. John's-wort	N
<i>Juglans cinerea</i>	butternut	N
<i>Leucothoe fontanesiana</i>	highland dog-hobble	N
<i>Monotropsis odorata</i>	sweet pinesap	N
<i>Phlox buckleyi</i>	sword-leaved phlox	N
<i>Pyrola elliptica</i>	shinleaf	N

Scientific Name	Common Name	Forest Distribution (Number of Occurrences)
Triphora trianthophora	nodding pogonia	N

Plan Components

Because these species are low in occurrence across the GWNF and can not be accurately predicted by availability of habitat, ecosystem and species diversity plan components should provide some protection for these species, but additional provisions are needed due to their rarity and sensitivity to management. The following standard was created to protect these species:

- Project planning and implementation should include measures to provide protection for the “species need occurrence protection” group.

Management Strategies

These species are rare in occurrence across the forest and known populations should be protected. Protection of habitat alone does not ensure protection of these species in most cases, and protection should be given to individuals when work is performed at known locations. Locations should be obtained and mapped for consideration during project planning.

Appendix 1. Species Not Carried Forward into the Ecological Sustainability Analysis

Taxa	Scientific_Name	Common_Name	Rationale
Nonvascular Plant	Anastrophyllum saxicola	Liverwort	1
Nonvascular Plant	Anzia americana	Foliose lichen	1
Nonvascular Plant	Brachydontium trichodes	Peak moss	1
Nonvascular Plant	Bryoerythrophyllum ferruginascens	Moss	1
Nonvascular Plant	Cephaloziella massalongi	Liverwort	1
Nonvascular Plant	Cephaloziella spinicaulis	Liverwort	1
Nonvascular Plant	Diplophyllum obtusatum	Liverwort	1
Nonvascular Plant	Drepanolejeunea appalachiana	Liverwort	1
Nonvascular Plant	Entodon sullivantii	Sullivan's entodon	1
Nonvascular Plant	Ephebe solida	Fruticose lichen	1
Nonvascular Plant	Fissidens appalachensis	Appalachian pocket moss	1
Nonvascular Plant	Heterodermia appalachensis	Foliose lichen	1
Nonvascular Plant	Homaliadelphus sharpii	Sharp's homaliadelphus	1
Nonvascular Plant	Hygrohypnum closteri	Closter's brook-hypnum	1
Nonvascular Plant	Hypotrachyna virginica	Foliose Lichen	1
Nonvascular Plant	Lejeunea blomquistii	Liverwort	1
Nonvascular Plant	Leptodontium excelsum	Grandfather Mountain excelsum	1
Nonvascular Plant	Lophocolea appalachiana	Liverwort	1
Nonvascular Plant	Macrocoma sullivantii	Sullivan's manned-moss	1
Nonvascular Plant	Melanelia stygia	Foliose lichen	1
Nonvascular Plant	Metzgeria fruticulosa (=M. temperata)	Liverwort	1
Nonvascular Plant	Metzgeria uncigera	Liverwort	1
Nonvascular Plant	Palamocladium leskeoides	Palamocladium	1
Nonvascular Plant	Pannaria conoplea	Foliose lichen	1
Nonvascular Plant	Pellia appalachiana (= Pelia X appalachiana)	Liverwort	1
Nonvascular Plant	Physcia pseudospeciosa	Rosette lichen	1
Nonvascular Plant	Plagiochila austinii	Liverwort	1
Nonvascular Plant	Plagiochila caduciloba	Liverwort	1
Nonvascular Plant	Plagiochila sullivantii var. sullivantii	Sullivan's leafy liverwort	1
Nonvascular Plant	Plagiochila virginica var virginica	Liverwort	1
Nonvascular Plant	Polytrichum appalachianum	Appalachian haircap moss	1
Nonvascular Plant	Riccardia jugata	Liverwort	1
Nonvascular Plant	Sphagnum fallax	Pretty peatmoss	3
Nonvascular Plant	Sphagnum flavicomans	Peatmoss	1
Nonvascular Plant	Sphagnum girgensohnii	Girgensohn's peatmoss	1
Nonvascular Plant	Sphagnum quinquefarium	Five-rowed peatmoss	1
Nonvascular Plant	Tetradontium brownianum	Little Georgia moss	1
Nonvascular Plant	Tortula ammonsiana = Syntrichia ammonsiana	Ammon's tortula	1
Nonvascular Plant	Xanthoparmelia monticola	Xanthoparmelia lichen	1
Vascular Plant	Aconitum reclinatum	white monkshood	1

Appendix 1

Taxa	Scientific_Name	Common_Name	Rationale
Vascular Plant	Anemone canadensis	Canada anemone	1
Vascular Plant	Arabis hirsuta var. adpressipilis	hairy rockcress	1
Vascular Plant	Arabis patens	Spreading rockcress	1
Vascular Plant	Arethusa bulbosa	Dragon's mouth	1
Vascular Plant	Baptisia australis	blue wild-indigo	5
Vascular Plant	Berberis canadensis	American barberry	1
Vascular Plant	Camassia scilloides	wild hyacinth	1
Vascular Plant	Carex conoidea	field sedge	1
Vascular Plant	Carex cristatella	crested sedge	1
Vascular Plant	Carex hitchcockiana	Hitchcock's sedge	5
Vascular Plant	Carex interior	inland sedge	1
Vascular Plant	Carex ormostachya	necklace spike sedge	1
Vascular Plant	Carex pedunculata	longstalk sedge	1
Vascular Plant	Carex plantaginea	Plantain-leaved sedge	3
Vascular Plant	Carex schweinitzii	Schweinitz's sedge	1
Vascular Plant	Carex tetanica	rigid sedge	5
Vascular Plant	Carex trisperma	Three-seeded sedge	5
Vascular Plant	Carex verrucosa	Warty sedge	1
Vascular Plant	Chenopodium simplex	Giant-seed goosefoot	3
Vascular Plant	Clematis coactilis	Virginia white-haired leatherflower	1
Vascular Plant	Clematis occidentalis	purple clematis	1
Vascular Plant	Crataegus calpodendron	pear hawthorn	1
Vascular Plant	Crataegus pruinosa	prunose hawthorn	3
Vascular Plant	Cymophyllus fraserianus	Fraser's sedge	5
Vascular Plant	Cyperus dentatus	toothed flatsedge	1
Vascular Plant	Cystopteris fragilis	fragile fern	4b
Vascular Plant	Delphinium exaltatum	tall larkspur	1
Vascular Plant	Desmodium canadense	showy tick-trefoil	1
Vascular Plant	Desmodium sessilifolium	sessile-leaf tick-trefoil	1
Vascular Plant	Diarrhena americana	Eastern beakgrass	5
Vascular Plant	Dicentra eximia	Bleeding heart	5
Vascular Plant	Dirca palustris	Leatherwood	3
Vascular Plant	Elymus canadensis	nodding wild rye	1
Vascular Plant	Epilobium ciliatum	Hair willow-herb	1
Vascular Plant	Eriophorum virginicum	Tawny cotton-grass	3
Vascular Plant	Eupatorium godfreyanum	Godfrey's thoroughwort	4a
Vascular Plant	Eupatorium maculatum	spotted joe-pye weed	4a
Vascular Plant	Euphorbia purpurea	glade spurge	1
Vascular Plant	Geranium robertianum	herb-robert	3
Vascular Plant	Geum aleppicum	yellow avens	1
Vascular Plant	Glyceria acutiflora	sharp-scaled manna-grass	5
Vascular Plant	Hasteola suaveolens	False Indian-plantain	1
Vascular Plant	Helianthemum propinquum	low frostweed	1
Vascular Plant	Helianthus atrorubens	Savanna hairy sunflower	5
Vascular Plant	Helianthus laevigatus	smooth sunflower	5
Vascular Plant	Heuchera parviflora	Little-leaved alumroot	1
Vascular Plant	Hexalectris spicata	crested coralroot	5
Vascular Plant	Huperzia appalachiana	Appalachian fir clubmoss	1

Taxa	Scientific_Name	Common_Name	Rationale
Vascular Plant	<i>Hydrocotyle americana</i>	American pennywort	3
Vascular Plant	<i>Hypericum ellipticum</i>	pale St. John's-wort	1
Vascular Plant	<i>Iliamna remota</i>	Kankakee globe-mallow	1
Vascular Plant	<i>Isoetes virginica</i>	Virginia quillwort	1
Vascular Plant	<i>Isotria medeoloides</i>	small whorled pogonia	1
Vascular Plant	<i>Juncus subcaudatus</i>	Woods rush	5
Vascular Plant	<i>Lachnanthes caroliniana</i>	Carolina redroot	1
Vascular Plant	<i>Linum lewisii</i>	prairie flax	1
Vascular Plant	<i>Linum sulcatum</i>	grooved yellow flax	4b
Vascular Plant	<i>Listera smallii</i>	Kidney-leaf twayblade	5
Vascular Plant	<i>Lithospermum latifolium</i>	American gromwell	5
Vascular Plant	<i>Lonicera canadensis</i>	American fly-honeysuckle	5
Vascular Plant	<i>Lycopodiella inundata</i>	northern bog clubmoss	1
Vascular Plant	<i>Lycopodiella margueritae</i>	Marguerite's clubmoss	1
Vascular Plant	<i>Lycopodium annotinum</i>	Stiff clubmoss	O
Vascular Plant	<i>Lysimachia radicans</i>	trailing loosestrife	1
Vascular Plant	<i>Lythrum alatum</i>	winged loosestrife	1
Vascular Plant	<i>Maianthemum stellatum</i>	starry false Solomon's-seal	1
Vascular Plant	<i>Malaxis bayardii</i>	Appalachian adder's-mouth	1
Vascular Plant	<i>Milium effusum</i>	Millet grass	5
Vascular Plant	<i>Monarda didyma</i>	Oswego Tea	5
Vascular Plant	<i>Onosmodium virginianum</i>	Virginia false-gromwell	1
Vascular Plant	<i>Paxistima canbyi</i>	Canby's mountain lover	1
Vascular Plant	<i>Penstemon hirsutus</i>	hairy beardtongue	5
Vascular Plant	<i>Phlox amplifolia</i>	Broadleaf phlox	1
Vascular Plant	<i>Platanthera flava</i> var. <i>herbiola</i>	Turbercle rein-orchid	5
Vascular Plant	<i>Polanisia dodecandra</i>	common clammy-weed	1
Vascular Plant	<i>Polygonum arifolium</i> = <i>arifolia</i>	Halberdleaf tearthumb	5
Vascular Plant	<i>Polygonum cilinode</i> = <i>Fallopia cilinodis</i>	Fringed black bindweed	4b
Vascular Plant	<i>Potamogeton hillii</i>	Hill's pondweed	1
Vascular Plant	<i>Prunus alleghaniensis</i>	Alleghany sloe	5
Vascular Plant	<i>Pseudognaphalium macounii</i>	Winged cudweed	1
Vascular Plant	<i>Pycnanthemum torreyi</i>	Torrey's mountain-mint	1
Vascular Plant	<i>Pycnanthemum virginianum</i>	Virginia mountain mint	5
Vascular Plant	<i>Ranunculus trichophyllus</i>	white water crowfoot	5
Vascular Plant	<i>Ribes lacustre</i>	bristly black currant	4a
Vascular Plant	<i>Robinia hispida</i> var. <i>kelseyi</i>	Kelsey's locust	4b
Vascular Plant	<i>Robinia viscosa</i>	Clammy locust	4b
Vascular Plant	<i>Rosa setigera</i>	prairie rose	1
Vascular Plant	<i>Sagittaria rigida</i>	sessile-fruited arrowhead	1
Vascular Plant	<i>Sanicula trifoliata</i>	Large-fruited snakeroot	5
Vascular Plant	<i>Saxifraga careyana</i>	Golden-eye saxifrage	1
Vascular Plant	<i>Saxifraga caroliniana</i>	Carolina saxifrage	1
Vascular Plant	<i>Saxifraga pensylvanica</i>	swamp saxifrage	5
Vascular Plant	<i>Scirpus torreyi</i>		1
Vascular Plant	<i>Scutellaria parvula</i> var. <i>parvula</i>	small skullcap	1
Vascular Plant	<i>Scutellaria saxatilis</i>	Rock skullcap	5
Vascular Plant	<i>Sida hermaphrodita</i>	Virginia mallow	1

Appendix 1

Taxa	Scientific_Name	Common_Name	Rationale
Vascular Plant	<i>Solidago squarrosa</i>	Squarrose goldenrod	5
Vascular Plant	<i>Sphenopholis pensylvanica</i>	Swamp wedgescale	0
Vascular Plant	<i>Stellaria longifolia</i>	Longleaf stitchwort	5
Vascular Plant	<i>Talinum teretifolium</i>	Roundleaf flame-flower	1
Vascular Plant	<i>Taxus canadensis</i>	Canada yew	5
Vascular Plant	<i>Thermopsis mollis</i> (= <i>T. m.</i> var. <i>mollis</i>)	Appalachian golden-banner	1
Vascular Plant	<i>Torreyochloa pallida</i>	Pale mannagrass	5
Vascular Plant	<i>Trifolium virginicum</i>	Kate's mountain clover	5
Vascular Plant	<i>Triosteum aurantiacum</i>	Horse gentian	5
Vascular Plant	<i>Vaccinium hirsutum</i>	Hairy blueberry	1
Vascular Plant	<i>Viola appalachiensis</i>	Appalachian blue violet	1
Vascular Plant	<i>Viola conspersa</i>	American dog violet	5
Vascular Plant	<i>Woodwardia areolata</i>	Netted chain fern	5
Vascular Plant	<i>Zigadenus elegans</i> ssp. <i>glaucus</i> = <i>Anticlea glauca</i>	white camas	1
Vascular Plant	<i>Agastache scrophulariifolia</i>	Giant purple hyssop	5
Vascular Plant	<i>Allium oxyphilum</i>	Nodding onion	1
Vascular Plant	<i>Aster laevis</i> var. <i>concinus</i>	Smooth purple aster	5
Vascular Plant	<i>Botrychium matricariifolium</i> = <i>Sceptridium oneidense</i>	Chamomile grape fern	4a
Vascular Plant	<i>Botrychium oneidense</i>	Blunt-lobed grape fern	4b
Vascular Plant	<i>Bouteloua curtipendula</i>	Side-oats grama	5
Vascular Plant	<i>Calamagrostis canadensis</i>	Canada reedgrass	5
Vascular Plant	<i>Campanula aparinoides</i>	Marsh bellflower	5
Invertebrate	<i>Amaurobius borealis</i>	Spider	4a
Invertebrate	<i>Anaplectoides brunneomedia</i>	Brown-lined dart moth	4a
Invertebrate	<i>Cleidogona fidelitor</i>	Faithful millipede	4a
Invertebrate	<i>Clubiona spiralis</i>	Two-clawed hunting spider	4a
Invertebrate	<i>Euchlaena milnei</i>	Looper moth	4a
Invertebrate	<i>Lytrosis permagnaria</i>	Geometrid moth	4a
Invertebrate	<i>Melanoplus acrophilus acrophilus</i>	Short-winged melanoplus	1
Invertebrate	<i>Melanoplus cherokee</i>	Cherokee melanoplus	1
Invertebrate	<i>Melanoplus divergens</i>	Divergent melanoplus	1
Invertebrate	<i>Melanoplus serrulatus</i>	Serrulate melanoplus	1
Invertebrate	<i>Nannaria shenandoah</i>	Shenandoah Mountain xystodesmid	4a
Invertebrate	<i>Pseudotremia alecto</i>	Millipede	4a
Invertebrate	<i>Psuedanophthalmus limicola</i>	Mud-dwelling cave beetle	1
Invertebrate	<i>Scudderia septentrionalis</i>	Northern bush katydid	1
Invertebrate	<i>Semionellus placidus</i>	Millipede	4a
Invertebrate	<i>Sphaeroderus schaumii</i>	Schaum's ground beetle	4a
Invertebrate	<i>Stygobromus</i> sp. nov.	Massanutten Spring Amphipod	4a
Invertebrate	<i>Synanthedon castaneae</i>	Chestnut clearwing moth	4a
Amphibian	<i>Plethodon shenandoah</i>	Shenandoah salamander	1
Amphibian	<i>Pseudacris brachyphona</i>	Mountain chorus frog	5
Reptile	<i>Pituophis melanoleucus</i>	northern pinesnake	1
Reptile	<i>Terrapene carolina</i>	eastern box turtle	5
Bird	<i>Aquila chrysaetos</i>	golden eagle	3

Key to Rationale

- 1 No occurrences or habitat known on the Unit.
- 2 Species is unaffected by Management
- 3 Unit is of marginal importance to conservation of the species.
- 4a Knowledge of species' ecology is insufficient to support conservation strategy.
- 4b Species' taxonomy is too uncertain to develop conservation strategy.
- 5 Species is common and demonstrably secure on the Unit.
- O Other (describe in comments)

Appendix 2. Species with Global Ranks of G-1, G-2, or G-3

Taxa	Common Name	Scientific Name	Global Rank	Confirmed Occurrence	Rationale for Selection / Non-selection (See Appendix 5 Table 7 for definitions)

Appendix 3. Other Species Addressed

Taxa	Common_Name	Scientific_Name	S1 - S2 ²	RFSS ³	S/E ⁴	SGCN ⁵	BCC ⁶	VA & WV ⁷
Species listed below with no "X" box checked were nominated by taxonomic experts for consideration in our process.								
Amphibian	Tiger Salamander	Ambystoma tigrinum	X			X		

² NatureServe ranking

³ Southern regional forester sensitive species

⁴ Social/ economic

⁵ Species of greatest conservation need

⁶ Birds of Conservation Concern

⁷ State tracked and watched plant list

Appendix 4. Species Screening

Taxa	Common_Name	Scientific_Name	Confirmed Occurrence	Secure in the plan area	Affected by Management	Included for further analysis	Rationale for selection/ non-selection
Amphibian	Tiger Salamander	Ambystoma tigrinum	N	N	N	N	Occurrence Not confirmed (1)

Defintion of Numbers in the Rationale Column in Appendixes 3 and 5.

Number	Description	Species
1	Occurrence Not Confirmed - These are species for which habitat exists on the Forest, and although occurrence is likely, it is not confirmed. Species on this list will be re-evaluated if occurrence on GWNF is confirmed.	
2	Not affected by management - Species which are not affected by any current or potential form of management or lack of management in the planning area.	
3	FS Importance to Global Viability is Low - This group is actually a subset of species that are not affected management. Species on this list are either 1) Aquatic and although they may occur within watersheds that overlap with USFS boundaries, they primarily use larger streams not affected by FS management, OR 2) Are migratory or transient species that use FS habitat for a very small proportion of their needs.	

Number	Description	Species
4	Poorly studied species - Species for which there is too little information known to complete a reliable assessment. This includes species with uncertain population status, uncertain taxonomy, uncertain distribution information, or uncertain life history information.	
5	Secure in the Plan Area - Species that are secure in the plan area based on knowledge of its occurrence, distribution, availability of habitat, and responses to any management of natural disturbances that might occur. Includes those species screened during the process with an S-rank lower than S2 or occurrence in SWG Plan less than Tier 2 and did not merit further consideration.	
6	Plan Components not necessary for these species - species are covered by plan components for ecosystem diversity, which will adequately provide habitat for these species; no other plan components are needed for species conservation. Ecosystem diversity plan components are described in the Ecological Diversity Report and include species associated with each ecological system as well as ecological diversity driven Plan components.	

Literature Cited